Remarks

Reconsideration of this Application is respectfully requested.

Upon entry of the foregoing amendment, claims 1-3, 5-13, 22, 26-33, and 35-37 are pending in the application, with claims 1, 22, and 31 being the independent claims.

Amendments were made to the specification to correct minor informalities and to improve readability. These changes are believed to introduce no new matter, and their entry is respectfully requested.

Based on the above amendment and the following remarks, Applicants respectfully request that the Examiner reconsider all outstanding objections and rejections and that they be withdrawn.

Double Patenting Rejection

In the current Office Action, the Examiner provisionally rejected all of the pending claims (claims 1-3, 5-13, 22, 26-33, and 35-37) under 35 U.S.C. § 101 as claiming the same invention as that of renumbered claims 1-4, 7, 11, 13, 17-24, 27, and 29-31 of copending U.S. Patent Application No. 09/098,041 (hereinafter, "copending application"). The Examiner states that "[t]he subject matter claimed in the instant application is fully disclosed in the copending Application No. 09/098,041 and is covered by the copending Application No. 09/098,041 since the copending Application No. 09/098,041 and the application are claiming common subject matter." Applicants respectfully disagree.

The Examiner states on page 2, section (A), of the current Office Action that claim 1 of the copending application teaches claims 1-2 of the present application, and that claims

1 and 2 of the present application recite the scope of invention of claim 1 of the copending application. Applicants respectfully disagree. Claim 1 of the copending application does not claim "a frame buffer coupled to the rasterization circuit for storing a plurality of *image* values *in the floating point format*,"as is claimed in independent claim 1 of the present application (emphasis added by Applicants). Nor does claim 1 of the copending application claim "a display screen coupled to the frame buffer for displaying an image according to the *image* values stored in the frame buffer," as is claimed in independent claim 1 of the present application (emphasis added by Applicants). "Image values" include color values, but also can include, but are not limited to, such attributes as perspective (i.e., depth) and texture. (See the specification at page 2, lines 8-9.)

The Examiner states on page 4, section (L), of the current Office Action that claims 17 and 22 of the copending application claim the limitations of claims 22, 26, 31-33, and 35 of the present application. Applicants respectfully disagree. With regard to independent claim 22 of the present application, neither claim 17 nor 22 of the copending application claim as a method step "rasterizing the data in a floating point format," as is claimed in step (a) of independent claim 22 of the present application. With regard to independent claim 31 of the present application, neither claim 17 nor 22 of the copending application claim "a raster subsystem for performing a rasterization process, the rasterization process performed in a floating point format; and a floating point frame buffer coupled to the raster subsystem for storing a plurality of floating point color values," as is claimed in independent claim 31 of the present application. In fact, claims 17 and 22 of the copending application focus on the frame buffer and do not address the rasterization process as do independent claims 22 and 31 of the present application.

For at least the reasons stated above, independent claims 1, 22, and 31, and the claims that depend therefrom (claims 2-3 and 5-13; claims 26-30; and claims 32-33 and 35-37, respectively) are patentable over the claims of the copending application. Applicants therefore respectfully request that the Examiner reconsider and withdraw the provisional statutory double patenting rejection of all of the pending claims and let this application pass to allowance.

The copending application was issued a Notice of Allowance on May 5, 2003. In order to expedite prosecution, Applicants file herewith a Terminal Disclaimer in compliance with 37 C.F.R. 1.321(c) to obviate any nonstatutory double patenting rejection.

Conclusion

All of the stated grounds of objection and rejection have been properly traversed, accommodated, or rendered moot. Applicants therefore respectfully request that the Examiner reconsider all presently outstanding objections and rejections and that they be withdrawn. Applicants believe that a full and complete reply has been made to the outstanding Office Action and, as such, the present application is in condition for allowance. If the Examiner believes, for any reason, that personal communication will expedite prosecution of this application, the Examiner is invited to telephone the undersigned at the number provided.

Prompt and favorable consideration of this Amendment and Reply is respectfully requested.

Respectfully submitted,

STERNE, KESSLER, GOLDSTEIN & FOX P.L.L.C.

Michael V. Messinger
Attorney for Applicants
Registration No. 37,575

Date: June 4, 2003

1100 New York Avenue, N.W.
Washington, D.C. 20005-3934
(202) 371-2600

Version with markings to show changes made

In the Specification:

Please amend the following paragraphs/sections as follows.

Amend the paragraph beginning on page 9, line 17, and ending on page 10, line 6, as follows:

Many different types of floating point formats exist and can be used to practice the present invention. However, it has been discovered that one floating point format, known as "s10e5," has been found to be particularly optimal when applied to various aspects of graphical computations. As such, it is used extensively throughout the geometric, rasterization, and frame buffer processes of the present invention. To optimize the range and precision of the data in the geometry, rasterization, and frame buffer processes, this particular s10e5 floating point format imposes a 16-bit format which provides one sign bit, ten mantissa bits, and five exponent bits. In another embodiment, a 17-bit floating point format designated as "s11e5" is specified to maintain consistency and ease of use with applications that [uses] use 12 bits of mantissa. Other formats may be used in accordance with the present invention depending on the application and the desired range and precision.

Amend the paragraph beginning on page 19, line 1, and ending on page 19, line 14, as follows:

For example, the maximum value that can be used in the 8-bit fixed point format is 127 (i.e., 2^8-1), which is written as 01111111 in binary, where the first digit represents the sign (positive or negative) and the remaining seven digits represent the number 127 in binary. In the prior art, this value is clamped and stored as 1.0 in the frame buffer. In an 8-bit floating point format, a value "n" is represented by the format n = s_eee_mmmmm, where "s" represents the sign, "e" represents the exponent, and "m" represents the mantissa in the binary formula $n = m \times 2^e$. Thus, in a floating point format, the largest number that can be written is 31×2^7, also written in binary as 01111111. In the present invention, the value is written to and stored in the frame buffer without being clamped or otherwise changed. Thus, use of the floating point format in the frame buffer permits greater flexibility in how a number can be represented, and allows for a larger range of values to be represented by virtue of the use of a portion of the data field to specify an exponent.

Amend the paragraph beginning on page 26, line 15, and ending on page 27, line 7, as follows:

Block 406 contains the clipping, perspective, and viewport application. Clipping refers to the elimination of the portion of a geometric primitive that is outside the half-space defined by a clipping plane. The clipping algorithm operates on floating point values. Perspective projection is used to perform foreshortening so that [he] the farther an object is from the viewport, the smaller it appears in the final image. This occurs because the viewing volume for a perspective projection is a frustum of a pyramid. The matrix for a perspective-view frustum is defined by floating point parameters. Selection and feedback modes are provided in block 407. Selection is a mode of operation that automatically

informs the user which objects are drawn inside a specified region of a window. This mechanism is used to determine which object within the region a user is specifying or picking with the cursor. In feedback mode, the graphics hardware is used to perform the usual rendering calculations. Instead of using the calculated results to draw an image on the screen, however, this drawing information is returned. Both feedback and selection modes support the floating point format.

Amend the paragraph beginning on page 27, line 9, and ending on page 28, line 15, as follows:

The actual rasterization is performed in block 408. Rasterization refers to converting a projected point, line, or polygon, or the pixels of a bitmap or image, to fragments, each corresponding to a pixel in the frame buffer 412. Note that all primitives are rasterized. This rasterization process is performed exclusively in a floating point format. Pixel information is stored in block 409. A single pixel (x,y) refers to the bits at location (x,y) of all the bitplanes in the frame buffer 412. The pixels are all in floating point format. A single block 410 is used to accomplish texturing, fog, and antialiasing. Texturing refers to the process of applying an image (i.e., the texture) to a primitive. Texture mapping, texels, texture values, texture matrix, and texture transformation are all specified and performed in floating point. The rendering technique known as fog, which is used to simulate atmospheric effects (e.g., haze, fog, and smog), is performed by fading object colors in floating point to a background floating point color value(s) based on the distance from the viewer. Antialiasing is a rendering technique that assigns floating point pixel colors based on the fraction of the pixel's area that is covered by the primitive being rendered. Antialiased rendering reduces or eliminates the jaggies that result from aliased rendering. In the currently preferred embodiment, blending is used to reduce two floating point color components to one floating point color component. This is accomplished by performing a linear interpolation between the two floating point color components. The resulting floating point values are stored in frame buffer 412. But before the floating point values are actually stored into the frame buffer 412, a series of operations are performed by per-fragment operations block 411 that may alter or even throw out fragments. All these operations can be enabled or disabled. It should be noted that although many of these blocks are described above in terms of floating point, one or several of these blocks can be performed in fixed point without departing from the scope of the present invention. The blocks of particular interest with respect to floating point include the rasterization 408; pixels 409; texturing, fog, and antialiasing 410[,]; per-fragment operations 411; and frame buffer and frame buffer control 412 blocks.